UTAH FLORA: SALICACEAE

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ABSTRACT.— A revision of the willow family, Salicaceae, is presented for the state of Utah. Included are 31 species and 5 subspecific taxa of indigenous and introduced plants. Keys to genera and species are provided, along with detailed descriptions, distributional data, and comments. No new taxa or combinations are proposed.

This paper is another in a series of works leading to a definitive treatment of the flora of Utah. The willow family as represented in Utah is rather small when compared to several other families, but its taxa cover the state, and it is complex. Herbarium specimens are frequently misidentified. Unisexual plants, extreme variation in leaves of fertile and vegetative or short and long twigs, and early deciduous flowers all contribute to the difficulty in identification of taxa. Hybridization especially in *Populus* further complicates identification.

Several members of the family are cultivated for ornamental plants or shade trees. Not all of these are included in this treatment. Among those not treated are *Populus candicans* Ait. (Balm of Gilead), *P. simonii* Carr., and *Salix viminalis* L. (Golden Osier).

Members of the family are important to many kinds of wildlife. For example, in Utah, beaver are almost totally dependent on the family. They utilize aspen, cottonwoods, and willows and avoid most other woody plants. Among the very few exceptions are probably *Alnus* and *Betula*.

The arabic numerals following the discussion of each taxon indicate the number of specimens examined in the preparation of this treatment. The roman numerals indicate the number of specimens collected by me.

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SALICACEAE MIRBEL.

Willow Family

Dioecious dwarf shrubs to large trees; leaves alternate, simple, entire, serrate, crenate, rarely lobed, usually stipulate, but the stipules often readily deciduous; flowers borne in aments (catkins), without a perianth, each subtended by a small, scalelike bract (commonly referred to as a scale); staminate flowers of (1)2–many stamens; pistillate flowers of a single pistil with 2–4 carpels and as many stigmas; placentation parietal or basal; fruit a sessile or stipitate capsule with 2–4 valves; seeds numerous, small, covered with long white hairs, dispersed easily by wind.

1. Trees with pendulous aments; leaf buds covered by several, usually resinous scales; each flower subtended by a cup-shaped disk, without obvious glands; stamens 6 to many; scalelike bracts subtending the flowers laciniate or fimbriate (except in *P. alba*), otherwise glabrous or ciliate ..... *Populus*

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— Trees, shrubs, or dwarf shrubs with mostly ascending to erect aments; leaf buds covered by a single nonresinous scale; each flower subtended by 1 or 2 basal glands, but without a disk; stamens (1)2–8, rarely more; scalelike bracts subtending the flowers entire or occasionally shallowly toothed, usually densely pubescent ..... *Salix*

POPULUS L.

Small to large trees; leaf buds covered by several overlapping scales, resinous in most taxa; aments pendulous, mostly appearing before the leaves, and often soon deciduous, the scalelike bracts very quickly deciduous, deeply lobed to laciniate, often dilated (entire or nearly so and not dilated in *P. alba)*; each flower subtended by a cuplike disk; stamens 6–60 or more, the filaments free; inserted on the disk; capsules pedicellate, with 2–4 valves, glabrous in our taxa except in *P. balsamifera.*

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1. At least some of the mature leaves deeply 3–5 lobed and aceriform, often densely tomentose beneath; bracts of flowers entire or shallowly toothed, long pilose-ciliate; twigs of the season and winter buds often white-woolly; stigma lobes slender; plants introduced, cultivated, and escaping ..... *P. alba*

— Leaves not deeply lobed, not aceriform, merely toothed, glabrous or nearly so; scales of flowers deeply lobed to lacerate 2

2(1). Bark white and smooth except blackened and rough where scarred, covered with a whitish powdery bloom; bracts of flowers more or less persistent, deeply lobed or cleft, ciliate with long white hairs; leaves orbicular to reniform-cordate; bud scales shiny but hardy resinous; stamens 6–14; capsules 4–6 mm long, with 2 carpels; stigmas slenderly lobed; plants not confined to water courses ..... *P. tremuloides*

— Bark turning gray or brown and roughly furrowed on older trunks; bracts of flowers laciniate-fringed, otherwise glabrous or inconspicuously short hairy; stamens 12–60 or more; capsules mostly longer, with 2–4 carpels; stigmas broadly dilated; plants mostly cultivated or growing along water courses or edges of lakes 3

3(2). Leaves 0.67–1.3 times longer than wide, deltoid to rhombic or ovate; petioles compressed laterally 4

— Leaves (1)1.2–7(10) times longer than wide, ovate to lanceolate; petioles terete or dorsiventrally compressed 6

4(3). Bud scales and twigs of the season pubescent; leaf blades commonly with 4–10(15) fine to coarse teeth on each side; branches widely spreading and the crown often as broad or broader than the tree is tall; plants native, sometimes cultivated, most common along the drainages of the Colorado River system, but sporadic along the Wasatch Front and elsewhere ..... *P. fremontii*

— Bud scales and twigs mostly glabrous; leaf blades commonly with 15–25(30) fine teeth on each side; branches ascending to erect and the crown mostly longer than wide; plants introduced, cultivated, sometimes persisting 5

5(4). Leaf blades rhombic-ovate, cuneate at the base, seldom over 7 cm long, capsules 2 valved; branches often comparatively small, strongly ascending to erect and the crown narrow and columnar (in the trees planted in our area) ..... *P. nigra*

— Leaf blades more or less deltoid or broadly ovate, broadly cuneate at the base, some regularly over 7 cm long; capsules 2 or more valved; branches large, spreading-ascending, the crown not columnar ..... *P. canadensis*

6(3). Leaf blades distinctly darker above than beneath, very strongly resinous especially when young, the petiole terete or nearly so; ovary and young fruit hairy or glabrous; stamens 30–60 ..... *P. balsamifera*

— Leaf blades about equally yellow-green on both sides; ovary and young fruit glabrous; stamens mostly 12–30 7

7(6). Leaf blades (1.8) 2.5–6 (9.5) times longer than wide; petioles 1/5–1/3 (2/5) as long as the blades, dorsiventrally compressed; carpels 2 ..... *P. angustifolia*

— Leaf blades 1–2.4 times as long as wide; petioles 1/5–3/4 as long as the blades, subterete or somewhat flattened; carpels 2 or 3; plants hybrids, intergrading into *P. angustifolia* on one hand and into *P. fremontii* and other broad-leaved poplars on the other ..... *P. acuminata*

Populus acuminata **Rydb.** Lanceleaf cottonwood. A series of hybrids between *P. angustifolia* and *P. fremontii* and other taxa with broad leaves, with features intermediate between the parents and intergrading into *P. angustifolia* on one hand and into the broad-leaved parent on the other; petioles commonly (1.5) 2.5–5.5 (6.5) cm long, 1/5–3/4 as long as the blade; leaf blades 1–2.4 times longer than wide. Along streams and rivers, edges of ponds and lakes, often in mouths of canyons where the parental types come together, probably cultivated, from (1370) 1525–1920 m, in Box Elder, Cache, Duchesne, Emery, Garfield, Iron, Kane, Salt Lake, San Juan, Sevier, Uintah, Utah, Wasatch, Washington, Wayne counties; throughout the range of *P. angustifolia*. The name *P. acuminata* in the strict sense is applied to crosses of *P. angustifolia* and *P. deltoides* Marsh. var. *occidentalis* Rydb. It is used here in a broad sense to include crosses with other broad-leaved taxa, including *P. balsamifera* and *P. fremontii*; 29(0).

Populus alba **L.** White poplar. Trees spreading by root sprouts, to about 30 m tall, the trunk to 1 m or more in diameter, the branches usually spreading, the crown more or less rounded; bark gray-green to whitish and smooth on upper parts of the trunk and branches, rough and furrowed and turning blackish on lower parts of old trunks; twigs tomentose or glabrous; buds tomentose; petioles terete 1–5 cm long, 0.2–0.6 times as long as the blade; leaf blades longer than wide, deltoid-ovate in outline, undulate toothed to deeply palmately 3–5 lobed and aceriform, the lobes serrate or crenate, the two primary lateral lobes sometimes hastately lobed, dark green above, silvery white-tomentose beneath or glabrous; aments appearing before or with the leaves, the rachis pilose-tomentose, the bracts entire to toothed, not laciniate, ciliate-fringed with long-pilose hairs, very quickly deciduous; staminate aments 8 cm long or more, the flowers with 6–10 stamens; pistillate aments 4–9 cm long; capsules 2–5 mm long, glabrous, 2–3 valved, the pedicels about 1(2) mm long; stigmas 2, each 2 lobed, the lobes linear, not dilated. Introduced from Eurasia, cultivated, escaping, and more or less naturalized, in populated areas, along fencelines, ditchbanks, and abandoned homesteads and fields, up to about 1980 m, to be expected in all counties of the state. Trees with leaves densely white-tomentose beneath are referable to **var.** ***alba***. Those with leaves and twigs glabrous or glabrate and fastigiate crowns are referable to **var.** ***bolleana*** **Lauche.** These may be hybrids between *P. alba* and some other species; 21 (ii).

Populus angustifolia **James** Narrowleaf cottonwood. Trees about 7–15(20) m tall, the trunk 30–60(80) cm in diameter, the branches erect-ascending, the crown more or less pyramidal; bark pale green to whitish when young, furrowed and grayish on old trunks, twigs glabrous or pubescent; buds ovoid-conic, pointed, strongly resinous, reddish brown, glabrous or pubescent; petioles semiterete or horizontally flattened and channeled above,

especially near the blade, 3–25 mm long, up to 0.3 (rarely 0.4) times as long as the blade; leaf blades 4–14 cm long, 0.7–2.5 (4.0) cm wide, (1.8) 2.5–6 (9.5) times longer than wide, lanceolate or occasionally narrow elliptical or ovate, glabrous or nearly so, usually acute at the apex, rounded at the base, the margins finely to coarsely serrate; aments often developing with the leaves, the rachis glabrous or nearly so, the bracts broadly obovate, deeply and irregularly lacrate; staminate aments 2–6 cm long, the flowers with 12–20 stamens; pistillate aments 6–10 cm long; capsules 3–6(7) mm long, 2 valved, glabrous, the pedicels about 2–10 mm long; stigmas 2, dilated, irregularly lobed. Along water courses, often in canyons, from about 1525–2135 (2440) m, in all counties of the state. Rather freely crossing with the broad-leaved species of the genus; 79 (i).

Populus balsamifera **L.** Balsam poplar, Black cottonwood. [*P. trichocarpa* T. & G.]. Tree 15–30(50) m tall; the trunk mostly 0.6–1 (1.5) m in diameter, bark furrowed and grayish on older trunks; buds large, the scales very resinous, glabrous or inconspicuously puberulent; petioles more or less terete, 2–6.2 cm long, 1/4–3/4 as long as the blade; leaf blades 4.3–11 cm long, 3.2–8 cm wide, 1.3–2.6 times longer than wide, ovate-accuminate, cuneate to cordate at the base, the margins crenulate, sometimes short ciliate, strongly resinous, glabrous at maturity on both sides, the upper side dark green, the lower side distinctly paler and often rufous tinged in dried specimens; bracts of aments lacerate-fringed, otherwise glabrous or sometimes with minute hairs, these not over 0.5 mm long; staminate aments 2–3(5) cm long, readily deciduous; stamens commonly 30–60; pistillate aments 8–20 cm long; capsules 5–8 mm long, glabrous or pubescent, subsessile; stigmas broadly dilated. Along streams, mostly in canyons and cultivated, 1370–2350 m, in Cache, Juab, Salt Lake, Sevier, Utah, Wasatch, and Wayne counties; widespread in North America from Newfoundland south to New York and west to Alaska (ssp. *balsamifera*), and from Alaska south to Baja California in the western part of the continent (ssp. *trichocarpa*). The native trees of our area are expected to be **ssp. *trichocarpa*** **(T. & G.) Brayshaw** with mostly pubescent and 3 (rarely 2–4) carpellate capsules. Some of the cultivated trees might be ssp. *balsamifera* with mostly glabrous and 2 (rarely 3–4) carpellate capsules; 9 (0).

Populus x canadensis **Moench.** Carolina poplar, Gray poplar. Cultivated and persisting, rarely escaping, to 40(50) m tall, the trunk 0.75–1.5(2) m in diameter; bark deeply furrowed and grayish on old trunks; buds large, the scales glabrous, but resinous; petioles laterally flattened 3.5–8.5 cm long, 1/3 to as long as the blade; leaf blades mostly 3.5–11.5 cm long, 3.5–11 cm wide, or much larger on stump sprouts, 0.9–1.3 (rarely to 1.5) times as long as wide, deltoid-ovate, acuminate at the apex, mostly broadly cuneate or truncate at the base, the margin crenate-serrate; glabrous and equally green on both sides; staminate aments about 7 cm long; stamens 15–25; pistillate aments unknown. Cultivated for shade trees, probably originated in France as a cross between *P. deltoides* Marsh. and *P. nigra* (Rehder, 1951), to be expected in nearly all counties of the state. *Populus deltoides* might also be expected in the state as an introduced tree from the Plains and eastward, but no specimens were seen that were clearly assignable to that taxon. The original Carolina poplar was *P. deltoides*, but for many years the nursery stock distributed under that name has been *P. x canadensis* (Hitchcock and Cronquist, 1964); 15 (ii).

Populus fremontii **Wats.** Fremont cottonwood. Trees 10–25 m tall with broad rounded crowns, the crown often as broad or broader than the tree is high, the trunk 0.5–1 (1.5) m in diameter; bark smooth and whitish on young trees and on twigs and young branches, deeply furrowed and grayish or brownish on old trunks; petioles (0.8) 3–9.5 cm long, one half to as long as the blade, flattened; rarely with two glands at the summit; leaf blades (2) 4–10 cm long, (15) 4.5–12.5 cm wide, or much larger on sterile sprouts, 0.67–1.2 times as long as wide, deltoid, ovate, rarely nearly rhombic, with truncate, cuneate, or occasionally cordate base, acuminate at the apex, coarsely to finely crenate or serrate with about 8–11 (15) glandular teeth, glabrous, greenish or yellow-green on both sides, turning yellow in autumn; staminate aments 4–10 cm long, the flowers

with a broad oblique disk and 50–80 stamens with dark red anthers; pistillate aments 5–15 cm long, the flowers with a cup-shaped disk, this to 5 mm wide in fruit; capsules 7–10 (12) mm long, to 8 mm wide, ovoid to subglobose, 3 to 4 valved, glabrous, the stipes 2–6 (10) mm long; stigmas strongly dilated and irregularly lobed. Along flood plains of rivers and along washes, irrigation ditches, and occasionally cultivated, from 762 to about 1860 m, in Cache, Duchesne, Garfield, Grand, Iron, Kane, Salt Lake, San Juan, Sevier, Tooele, Uintah, Utah, Washington, Wayne, and Weber counties. The Fremont cottonwood is abundant along the Colorado, Green, San Juan, and Virgin rivers and their tributaries within the Colorado Drainage, to be expected anywhere in the state as it has been cultivated for a shade tree. This tree is part of a transcontinental complex, of which *P. arizonica* Sarg., *P. deltoides*, *P. sargentii* Dode, and *P. wislizeni* (Wats.) Sarg. are a part. *Populus arizonica* and *P. wislizeni* have generally been considered closely allied to *P. fremontii* and they have by some authors been included as varieties of or as synonymous with *P. fremontii*. Specimens that have capsules with stipes up to 6 or even 10 mm long are found in Emery County and other points along the Colorado River system. These trees have been referred to as *P. fremontii* var. *wislizeni* Wats. Based on the long stipes, these trees have recently been assigned to *P. deltoides* var. *wislizenii* (Wats.) Eckenwalder (Eckenwalder, 1977). However, these trees are like *P. fremontii* in the lack of glands at the junction of petiole and blade and with few, broad, and coarse teeth on leaf margins. Based on my provincial study, I am not well prepared to make a judgment as to the specific assignment of these trees, but I prefer the traditional approach. If *P. fremontii* is to be kept separate at all from *P. deltoides*, I feel these plants are best kept as a part of *P. fremontii*; 98 (ii).

***Populus nigra* L.** Black poplar. Tree to 30 m tall; bark deeply furrowed and grayish on old trunks; bud scales glabrous, resinous; petioles flattened laterally, slender 1–4.5 cm long, 0.4–0.8 times as long as the blade; leaf blades 2.2–6.5 cm long, 1.8–8 cm wide, occasionally larger 0.8–1.2 (rarely 1.4) times as long as wide, very often as wide or wider than long, rhombic ovate, or orbicular, usually strongly accuminate at the apex, cuneate at the base, glabrous, equally green on both sides or a little darker above, the margin crenate-serrate, not ciliate; bracts of aments laciniate; staminate aments 4–6 cm long; stamens 20–30; pistillate aments not seen. Introduced, cultivated for shade and wind breaks, specimens seen from Beaver, Salt Lake, and Utah counties, but to be expected throughout the state. Most of the trees in our area are from a staminate clone with strongly ascending branches that produced a narrow, often nearly cylindrical crown. Trees of this clone have been assigned to **var. *italica* Duroi**, Lombardy poplar; 6 (0).

***Populus tremuloides* Michx.** Aspen, quaking aspen, quakey. Colonial tree 10–15 (20) m tall, seldom taller; the trunk seldom over 40 cm in diameter; bark white and smooth, covered with a powdery white bloom, turning black and rough where scarred and at the base of very old trunks; branches usually spreading, the crown usually rounded; bud scales shiny but hardly resinous; petioles laterally flattened, 2–5.5 cm long (1/2) 3/4 to nearly as long as the blade; leaf blades 2–6.5 cm long, 1.8–6.5 cm wide, or much larger on stump sprouts, 3/4–1 1/3 times longer than wide, ovate to reniform-cordate, the margin subentire to serrate or undulate, ciliate, glabrous on the surfaces at maturity; bracts of the aments more or less persistent, especially the staminate ones, 3–7 lobed or cleft, silky-pilose ciliate, the hairs up to 2 mm long; staminate aments 2–4 cm long, readily deciduous; stamens 6–14; pistillate aments 4–12 cm long, to 13 mm wide; capsules 4–6 mm long, the stipes 1–2 mm long, subtended by a cuplike disk about 2 mm across; carpels 2; stigmas 2, each deeply cleft into 2 or more slender lobes. Along water courses and forming clones and aggregates of clones on canyon walls and mountain sides, from (1400) 1830–3050 (3200) m, in all counties of the state; widespread in North America from Labrador to Alaska and south to Tennessee and northern Mexico. Aspen is cultivated as a shade or ornamental tree. In recent years, nursery stock has become readily available from commercial nurseries; 96 (i).

SALIX L.

Depressed, mat-forming dwarf shrubs to large trees; buds covered with one nonresinous scale; aments erect to spreading, rarely drooping, developing before (precocious), with (coetaneous) or after (serotinous) the leaves, the bracts mostly entire, occasionally with a slightly toothed apex; flowers with 1, occasionally 2 minute glands near the base; stamens (1) 2–8 (12), the filaments free or united toward the base, inserted on the base of the bract; capsules sessile or stipitate, glabrous or pubescent.

A large genus of about 300 species, mostly of the Northern Hemisphere, most common in arctic and temperate regions.

Identification of the willows is compounded by unisexual plants, aments that are sometimes precocious and mostly early deciduous, and variation among the usually smaller leaves of the flowering branches which often lack or have inconspicuous stipules and the usually much larger leaves and stipules of vegetative branches and particularly of vigorous young shoots. Thus, herbarium specimens of each species present specimens of 3 or 4 phases (pistillate, staminate, flowering twigs with or without the deciduous aments, and vegetative twigs). Vigorous young shoots sometimes add a fifth dimension. At times whole plants in the field present only one or two of the various phases.

To facilitate identification of plants of the different phases, pistillate, staminate, and vegetative features have been included in many of the leads in the key. Thus, some of the leads are rather long, and features not applicable to a particular specimen will need to be skipped. An alternative approach to lengthy leads is separate keys for the different sexual and vegetative phases. Many such keys have been written, but these sometimes also contain a mixing of vegetative and sexual features. To establish an adequate basis for a staminate key, I feel that many more staminate specimens are needed in the herbaria of the state.

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1. Plants shrubs or dwarf shrubs not over 1 (1.5) m tall, subalpine to alpine 2
— Plants shrubs or trees, mostly over 1.5 m tall, of valleys to montane 3

2(1). Plants depressed dwarf shrubs 1–10 (20) cm tall mostly alpine, often forming mats, the stems creeping on or below the ground surface ..... **KEY I**
— Plants (10) 20–100 cm tall or taller, subalpine or alpine, not forming mats on the ground, the stems ascending to erect ..... **KEY II**

3(1). Leaves (8) 10–20 (32) times longer than wide; plants often strongly colonial, spreading underground and forming patches and occasionally thickets, our most common and widespread lowland willow ..... *S. exigua*
— Leaves less than 8 times as long as wide 4

4(3). Bracts persistent, dark brown to blackish or if pale green or pale brown in age then silky pilose with the hairs exceeding the bract by 1–2 mm and the capsules pubescent (rarely glabrous in unusual specimens); stamens 2 per flower,

the filaments glabrous or pilose in a few species; plants shrubs or occasionally treelike, mostly native ..... **KEY III**

— Bracts of at least the pistillate aments quickly deciduous, pale green or yellowish tan in age, short pubescent, the hairs hardly if at all exceeding the bract by more than 1 mm; capsules glabrous; stamens more than 2 per flower, or if only 2 then plants introduced trees, the filaments pilose; plants mostly trees or treelike except in *S. lasiandra*, mostly of valleys and lower montane 5

5(4). Plants native; stamens 3–9 per flower; stipes of capsules mostly 1–2 mm long, obviously longer than the gland ..... **KEY IV**

— Plants introduced trees; stamens 2 except in *S. pentandra;* capsules sessile or the stipes mostly less than 1 mm long and hardly longer than the gland ..... **KEY V**

KEY I.

Depressed, mat-forming dwarf shrubs, 1–10 (20) cm tall, at or above timberline

1. Bracts of aments pale green or yellowish, glabrous dorsally; filaments 1.5–2 mm long; style obsolete or to 0.2 mm long, shorter than the stigma; leaves elliptic to orbicular, 1.4–2.6 times longer than wide, glaucous and strongly reticulate-veined beneath, the tips mostly rounded or obtuse ..... *S. reticulata*

— Bracts of aments blackish, pilose dorsally; filaments over 2 mm long; styles 0.5 mm long or longer, longer than the stigmas; leaves elliptic or narrow elliptic, (1.25)2.3–4.7 times longer than wide, glaucous or not, not strongly reticulate veined beneath, the tips mostly pointed 2

2(1). Leaves 2–5 (7) mm wide, 2–4.7 times longer than wide, sessile or the petiole to 3 mm long; plants seldom over 3 cm tall, aments 0.5–2.2 cm long ..... *S. cascadensis*

— Leaves 5–20 mm wide, mostly 2–3 times longer than wide, with petiole 3–13 mm long; plants mostly 5–10 (20) cm tall; aments (1) 2–4 cm long ..... *S. arctica*

KEY II.

Low shrubs (10) 20–100 (300) cm tall, mat forming, subalpine or alpine

1. Capsules glabrous, the style and stigma together less than 1 mm long; leaves permanently pubescent on both sides, the lower surface not glaucous but often more densely pubescent and thus lighter than the upper surface; twigs of the season glabrous or thinly villous-puberulent ..... *S. wolfii*

— Capsules pubescent at least until mature or style and stigma together over 1 mm long; leaves often glaucous beneath, glabrous or pubescent 2

2(1). Mature leaves glabrous, dark green and shiny above, strongly glaucous and glabrous or with a few hairs beneath; twigs of the season glabrous or very scattered pubescent, dark chestnut to lustrous purplish black; aments precocious or coetaneous, sessile or nearly so or rarely on a stalk to 0.5(1) cm long, this neither bearing nor subtended by bractlike leaves; style and stigmas collectively 1.5 mm long or longer; filaments of stamens glabrous ..... *S. planifolia*

— Mature leaves pubescent on both sides, but sometimes glabrate or glabrous in age; twigs of the current season densely pubescent; aments coetaneous or subserotinous, born on stalks to 2 (4) cm long, these usually bearing and subtended by bractlike leaves; style and stigmas collectively up to 1.5 mm long; filaments of stamens sometimes pilose 3

3(2). Bracts of aments pale green when young, tan in age; capsules 3–5 mm long, pubescent even in age, crowded and nearly sessile so as to mostly conceal the rachis at the center of the aments, the stipes seldom over 0.5 mm long; pistillate aments 0.8–2 (2.5) cm long, 8–10 mm wide; staminate aments about 0.8–1 (1.2) cm long, 5–6 mm wide, the filaments densely pilose at the base and for 1/2 to 3/4 their length, the pilose portion often equaling or exceeding the scale, the anthers usually less than 0.5 mm long; petioles 1–4 mm long, seldom exceeding the bud even on vegetative twigs ..... S. *brachycarpa*

— Bracts of aments brown to blackish, sometimes light brown to whitish tan but not green even when young; capsules (4) 5–7 (8) mm long, sometimes glabrate in age, dense but often not so crowded as to conceal the rachis at the center of the ament, the stipes 0.5–2 mm long; pistillate aments (1.8) 2.5–5 cm long, 11–15 mm wide; staminate aments 0.8–2(4) cm long, sometimes over 6 mm wide, the filaments glabrous or pilose but usually not so conspicuously pilose as above, the anthers mostly over 0.5 mm long; petioles (1) 2–6 (10) mm long, equaling or often exceeding the bud, especially on vegetative twigs ..... S. *glauca*

KEY III.

Mostly native shrubs or small trees; aments mostly with dark bracts; stamens 2; capsules glabrous or pubescent

1. Capsules glabrous; leaves not both glaucous and pubescent on the lower surface when fully expanded; hairs of aments mostly crisped-villous and more or less tangled except in S. *wolfii* with aments 0.8–2(3) cm long or in S. *planifolia* and then plants keyed both ways 2

— Capsules mostly pubescent except in S. *lasiolepis*; leaves glaucous and pubescent on the lower surface when fully expanded; hairs of aments straight or slightly wavy but hardly crisped-villous or tangled; aments sometimes longer than in S. *wolfii* 6

2(1). Leaves glaucous beneath, not or scarcely pubescent when fully expanded 3

— Leaves not glaucous beneath, although sometimes lighter colored from pubescence; pubescent at least in part on both sides when fully expanded, but sometimes glabrate in age 5

3(2). Aments sessile or on a stalk, the stalk to 0.5(1) cm long neither bearing nor subtended by bractlike leaves; pubescence of aments straight or nearly so; leaves mostly entire, often slightly revolute; twigs dark chestnut to lustrous purplish black, essentially glabrous; plants often less than 1.5 m tall and keyed also in Key II ..... S. *planifolia*

— Aments usually stalked, the stalk usually subtended by or bearing 1–4 bractlike leaves; pubescence of aments crisped-villous; leaves serrate, serrulate, or entire, not at all revolute; twigs variously colored, glabrous or those of the current season more often pubescent; plants often over 1.5 m tall 4

4(3). Styles 0.7–1.5(1.8) mm long; leaves of fertile and vegetative twigs often less than 3 times longer than wide, evidently crenulate-serrate or subentire; bark of older twigs not ashy gray or whitish; plants apparently uncommon, in the eastern and central part of the state, mostly montane ..... S. *monticola*

— Styles 0.2–0.7 mm long; leaves of vegetative twigs 2–5 times longer than wide, serrulate or entire; bark of older twigs usually ashy gray or white; plants widespread, mostly of valleys and lower montane ..... S. *lutea*

5(2). Aments precocious or coetaneous (1.5) 2–5 cm long, with dense crisped-villous, tangled hairs; leaves subglabrate in age, with inconspicuous hairs, entire or sometimes serrulate; plants sometimes over 2 m tall ..... *S. boothii*

— Aments coetaneous, 0.8–1.5 (3) cm long, with hairs straight or nearly so; leaves permanently pubescent throughout on both sides even in age, the hairs readily conspicuous with a 10-power lens, entire; plants 0.6–1.5(2)m tall, also keyed in Key II ..... *S. wolfii*

6(1). Twigs strongly blue glaucous, the bloom sometimes deciduous, but then the twigs glabrous or sometimes puberulent; larger leaves mostly 3–5 times longer than wide, sericeous beneath; capsules densely pubescent 7

— Twigs not glaucous or those of the current season often pubescent, or leaves not sericeous; the larger leaves various but sometimes wider than above; capsules pubescent or glabrous 8

7(6). Pistillate aments 2–5 cm long; capsules sessile or the stipes to 1 mm long, the style and stigmas together 0.8–1.3 mm long; staminate aments about 2 cm long, the filaments glabrous; aments sessile or nearly so with or more often without subtending bractlike leaves, precocious or subcoetaneous; bracts of the aments blackish; leaves permanently silvery, silky-sericeous to subtomentose beneath, dark green and glabrous above in age ..... *S. drummondiana*

— Pistillate aments 1–2 cm long; capsules stipitate, the stipes 2–3 mm long, the style and stigmas together about 0.5 mm long; staminate aments 8–15 mm long, the filaments pilose on the lower 1/2; aments borne on 2–10 mm long, bracteate-leafy stalks; coetaneous or subprecocious; bracts of the aments dark at the tip and pale below; leaves sericeous when unfolding, sparsely or moderately sericeous, especially beneath when fully expanded, glabrate in age especially above ..... *S. geyeriana*

8(6). Plants shrubs 0.6–3 m tall, midmontane to above timberline, the stems less than 4 cm thick; leaves mostly less than 2 cm wide, occasionally wider on vegetative twigs, elliptic to narrowly lanceolate ..... **KEY II**

— Plants shrubs or small trees, commonly 3–4 m tall or taller, but sometimes shorter, of valleys or montane, the stems of mature plants often 4–10 cm thick or thicker; leaves sometimes over 2 cm wide, oblong, obovate, oblanceolate, or elliptic 9

9(8). Capsules glabrous; filaments about 3–5 mm long, bracts of aments blackish or purplish black, about as wide as long and rounded at the apex, densely pilose-tomentose, the hairs exceeding the bracts by about 1 mm; leaves oblong to oblanceolate, less than 15 mm wide except on vigorous young shoots; plants of Great Basin and Virgin River drainages ..... *S. lasiolepis*

— Capsules pubescent; filaments longer or bracts not as dark; bracts of aments of lighter color or if blackish then with hairs exceeding the bracts by about 2 mm, pointed or somewhat rounded; leaves elliptic, obovate, to oblanceolate, sometimes over 15 mm wide; plants of various distribution 10

10(9). Twigs of the second and current year and the dark red bud scales velvety villous; lower surface of leaves densely velvety villous throughout the season, twigs with longitudinal ridges beneath the bark; aments precocious; plants introduced, cultivated ..... *S. cinerea L.*

— Twigs of the second year glabrous, those of the current season villous or with appressed hairs; lower surface of leaves villous at first but usually rather scattered-villous to glabrate in age; aments various; plants native 11

11(10). Bracts of aments pale green or tan to very light brown in age, silky pilose, the hairs exceeding the bract by about 1 mm; aments coetaneous; capsules long beaked, loosely arranged so as to expose much of the rachis; filaments of stamens 3–6 mm long; leaves mostly elliptic, occasionally lanceolate or obovate; twigs of the season with mostly appressed or ascending hairs or occasionally glabrous ..... *S. bebbiana*

— Bracts of aments black or purplish black, reddish or pale only at the very base, pilose, the hairs exceeding the bract by about 2 mm; pistillate aments precocious, or subprecocious, the capsules not long beaked, densely arranged and mostly concealing the rachis; staminate aments strictly precocious, the filaments about 10 mm long; leaves obovate or oblanceolate; twigs of the season with mostly widely spreading hairs ..... *S. scouleriana*

KEY IV.

Plants native, tall shrubs or small trees; bracts of aments pale green or yellow, at least the pistillate ones, deciduous; stamens 3–8(12); capsules glabrous with a 1–2 mm long stipe

1. Bracts of aments 3–4 mm long; bud scales fused, without free overlapping margins, blunt to rounded at the tip; staminate aments 2–3.5 times longer than wide, 1–3.5 cm long; styles 0.5–1 mm long; petioles of larger leaves often with wartlike glands near the base of the blade; plants mostly multistemmed, large shrubs from large root crowns, rarely trees, widespread in the northern half of the state ..... *S. lasiandra*

— Bracts of aments 1–2 mm long; bud scales with free overlapping margins, usually pointed at the tip; staminate aments often narrower and longer than above; styles 0.1–0.2 mm long; petioles without wartlike glands or occasionally with glands in *S. nigra*; plants mostly trees with solitary or few trunks, of various distribution 2

2(1). Leaf blades not glaucous beneath, (2.5)4–7 times longer than wide; twigs whitish or grayish yellow; plants of the southern half of the state ..... *S. nigra*

— Leaf blades glaucous beneath 3

3(2). Twigs reddish or reddish brown, often pubescent at least near the nodes, horizontal or spreading; some of the leaf blades usually 4–5 times longer than wide, shiny dark green above; plants of San Juan and Washington counties ..... *S. laevigata*

— Twigs ashy gray or yellowish when fresh, glabrous, tending to droop; leaf blades usually not over 3 times longer than wide, not shiny dark green above; plants widespread in the state, mostly north of the counties listed above ..... *S. amygdaloides*

KEY V.

Plants small or rather large trees, introduced, cultivated, sometimes escaping and persisting; bracts of aments pale green or yellowish, at least the pistillate ones deciduous; capsules glabrous, sessile or nearly so

(Note: The cultivated species of this key, except *S. fragilis*, are not described due to lack of adequate specimens in herbaria.)

1. Stamens 3–12; leaves with wartlike glands on upper part of petiole and lower margins of blade, the blade seldom over 3 times longer than wide, usually glabrous except above along the midrib, lighter beneath than above but not glaucous (bay willow) ..... *S. pentandra L.*

— Stamens 2; leaf blades 3–5 times longer than wide, usually glaucous beneath, glabrous or variously pubescent 2

2(1). Pistillate aments 1–2.5 (3) cm long, the capsules 1–2.5 mm long; staminate aments to 4 cm long; petioles glandless; trees weeping, with very slender, greatly elongate, pendulous branches, or if not weeping then the twigs more or less contorted 3

— Pistillate aments mostly over 3 cm long, the capsules 3–6 mm long; petioles sometimes with small glands near the base of the blade; trees not weeping, with upright branches; twigs spreading, not contorted 5

3(2). Trees not weeping; twigs not pendulous, more or less contorted, aments 1–1.5 cm long; (all specimens seen from the state were referrable to f. *tortuosa* Rehd. with the branches twisted and contorted — corkscrew willow) ..... *S. matsudana Koidz.*

— Trees weeping; twigs pendulous, very straight; aments sometimes longer than above 4

4(3). Leaves mostly 3–15 mm wide, mostly deciduous in October; twigs often bright yellow; capsules sessile (weeping willow) ..... *S. babylonica L.*

— Leaves 15–22 mm wide, often persisting into December; twigs greenish or yellow-green; capsules with stipe exceeding the gland; plants hybrids of *S. babylonica* x *S. fragilis* (Niobe or Wisconsin weeping willow) .... *S. x blanda* Anderss.

5(2). Leaves glabrous when unfolded, the margin of mature leaves usually serrate with 4–8 teeth per cm; twigs glabrous, or nearly so; stipe of capsules 0.5–0.8(1) mm long; plants common, cultivated, and escaping ..... *S. fragilis*

— Leaves sericeous, or glabrous when unfolded, the margin of mature leaves finely serrulate with 9–10 teeth per cm; twigs sometimes pubescent; capsules sessile or subsessile; plants not known outside of cultivation (white willow) *S. alba L.*

Salix amygdaloides **Anderss.** Peach-leaf willow. Plants mostly small trees, rarely shrublike, mostly 4–10 (12) m tall, often with 2–4 leaning trunks; twigs whitish, yellowish, or ashy gray, rarely reddish, glabrous except when very young; stipules usually minute and soon deciduous; petioles (3) 5–15 (25) mm long; leaf blades, (1.8) 2.3–6 (7.5) cm long, (7) 12–19 (23) mm wide, or up to 10.5 cm and 3.2 cm wide on vigorous young shoots, elliptical to lanceolate, entire or serrulate, glabrous except when very young, glaucous beneath, green above; aments coetaneous, rarely subprecocious, on leafy or bracteate twigs of the season, 1.5–4 cm long; bracts of the aments 1–2 mm long, at least the pistillate ones soon deciduous, pale green, orbicular, the dorsal side woolly-pilose below and along the margins, but mostly glabrous toward the apex, the ventral surface woolly-villous throughout, the hairs seldom exceeding the bract by more than 0.5 mm; staminate aments 2–10 cm long, 7–11 mm wide; stamens 4–7, the filaments pilose on the lower half; pistillate aments (1.5) 2.5–8 cm long, 13–20 mm wide; capsules 4–7 mm long, glabrous, the stipe 1.2–3 mm long, the style about 0.2 mm long, not longer than the stigmas. Lake and pond margins and along ditches, streams, and rivers, and in neglected fields and pastures, from about 1070–1710 m in Box Elder, Davis, Duchesne, Emery, Juab, Salt Lake, Tooele, Uintah, Utah, and Washington counties; southern Canada and widespread in the United States except the southern part; 63 (vi).

Salix arctica **Pall.** Arctic willow. [*S. anglorum* Cham. var. *antiplasta* Schneid.]. Depressed shrubs with stems creeping on or under the ground, seldom rising more than 10 (20) cm above ground level, tending to form mats, but not so much as in *S. cascadensis* or *S. reticulata*; stipules minute or lacking; petioles 2–12 mm long; leaf blades (5) 11–47 mm long, (4) 6–16 mm wide, elliptical, narrow elliptical, obovate, or oblanceolate, entire, slightly paler beneath than above but not strongly glaucous; pilose-sericeous when

young, sparingly pubescent or glabrous when mature; aments coetaneous, borne on glabrous or pubescent 7–35 mm long leafy-bracteate or barren twigs of the season; bracts of the aments persistent, dark brown, pinkish purple at the base, pilose-sericeus on both sides, sometimes less so dorsally than ventrally, the hairs exceeding the bract by about 1 mm; staminate aments 15–25 mm long, about 7–9 mm wide; stamens 2, the filaments glabrous, to about 7 mm long; pistillate aments 1.5–7 cm long, about 10–12 mm wide, with 25–75 fruits; capsules 4–7 mm long, pubescent, the stipe about 1 mm long, the style and stigmas together about 1–2 mm long. About snowbanks, meadows, shores of lakes, and rocky slopes near or a little above timberline, 2775–3600 m on the Bear River (Mt. Naomi), Tushar (Delano Peak), western Uinta, and the Wasatch mountains in Cache, Piute, Salt Lake, Summit, and Utah counties; circumboreal and south in mountains of western North America to California and New Mexico. Our plants are **var. *petraea* Anderss.** They more or less intergrade into S. *cascadensis* in the Uinta Mountains; 14 (0).

***Salix bebbiana* Sarg.** Bebb willow. Plants shrubs, occasionally treelike, (2) 4–6 (8) m tall, with 1 to several stems, young twigs glabrous, puberulent or densely pubescent; stipules usually inconspicuous and soon deciduous; petioles (2) 3–8 (10) mm long, reddish or pale; leaf blades 1–4 cm long, 1.2–2 cm wide or to 7 cm long and 3 cm wide on vigorous young shoots, 2.2–2.8 times longer than wide, mostly elliptical, occasionally obovate or oblanceolate, entire to slightly undulate-crenate, dark green above, glaucous beneath, pubescent when young on both sides; fully expanded leaves glabrous above, usually with a few hairs beneath near the midrib; aments coetaneous, on a bracteate 3–15 mm long peduncle; bracts of the aments persistent, pale green to very light brown in age, sometimes reddish at the apex, particularly in staminate aments, silky pubescent, the hairs exceeding the bract by about 1 mm; staminate aments 1.5–2 cm long, to 13 mm wide; stamens 2, the filaments 3–6 mm long, glabrous or sparingly pilose at the base; pistillate aments 1.5–4(5) cm long, to 2 cm wide; capsules 6–8(10) mm long, rostrate with a rounded basal portion 1–2 mm wide and a long slender beak, pubescent, rather loosely arranged and not concealing the rachis, the stipe 2–3.5 mm long, the style about 0.1–0.2 mm long; stigmas 0.3–0.5 mm long, bilobed to the base. Riparian communities on canyon bottoms and along streams in mountains, occasionally along irrigation ditches, from (1370) 1830–2710 m in Box Elder, Cache, Daggett, Davis, Garfield, Grand, Juab, Kane, Rich, Salt Lake, San Juan, Sevier, Summit, Uintah, Utah, Wasatch, Washington, and Wayne counties; across much of Canada and northern United States. Our plants with leaves sparsely appressed pubescent and soon glabrous beneath and rather weakly raised reticulate-veiny are often referred to as var. *perrostrata* (Rydb.) Schneid., but the separation probably merits no recognition. 77(x).

***Salix boothii* Dorn** Booths willow. [S. *pseudocordata* (Anderss.) Rydb., misapplied]. Shrubs (1.5) 2–4 m tall; young twigs finely hairy, stipules small, inconspicuous and soon deciduous or larger and leaflike on vigorous young shoots; petioles mostly 2–5 mm long; leaf blades (0.8) 2.5–6 cm long, (4) 8–22 mm wide, or to 11.2 cm long and 4 cm wide, with petiole to 2 cm long on vigorous shoots, elliptical, lanceolate, occasionally nearly linear, rarely oval, entire or serrulate, not glaucous beneath, sparingly to moderately pubescent at least in part on both sides, or glabrate toward the end of the season, about as pubescent at the apex as at the base, coriaceous in age; aments subprecocious or coetaneous, sessile or on a barren or 1–3 bracteate peduncle to 8 mm long; bracts of the aments persistent, dark brown to purplish black at the apex, often with a lighter base; pubescence of aments sericeus-pilose at first but soon becoming crisped-villous and somewhat entangled, the hairs usually exceeding the bracts by 1–2 mm, sometimes deciduous; staminate aments 1–2.5 cm long; stamens 2, the filaments about 5 mm long, glabrous; pistillate aments (1) 2–4 (6) cm long; capsules 3–6 mm long, glabrous, the stipe 1.5–2 mm long; styles 0.3–1 (1.5) mm long. Riparian and wet meadow communities from about 2075–3050 m, particularly common on the plateaus of central Utah, but from all counties of the state except Millard, Morgan,

Rich, Tooele, Washington, Wayne, and Weber and to be expected in some of these; Colorado Rockies west to northern California and north to southern Alberta and British Columbia. Our plants are closely related to *S. myrtillifolia* Anderss. of Alaska and Canada. They vary from those of Alaska and Canada by either taller stature or pubescent leaves or both, and they have longer stipules that are more sharply acute at the apex. They might be treated as a variety of *S. myrtillifolia*, but no new combination is proposed here. Sometimes referred to as *S. pseudocordata*, but this name is synonymous with *S. myrtillifolia* (Dorn 1975). Occasionally grading toward *S. wolfii* in pubescence of leaves and sometimes difficult to distinquish from that species vegetatively. Like *S. lutea* in color and pubescence of scales and rachis of aments, and sometimes confused with that species, but with leaves coriaceous in age and more and persistently pubescent and not glaucous beneath, and generally of higher elevations, but sometimes nearly impossible to distinguish from *S. lutea* in leafless or very young-leaved specimens with precocious aments. However, older twigs of *S. boothii* are not whitish as they often are in *S. lutea*, and specimens with older twigs are more easily distinguished; 139 (xli).

Salix brachycarpa* Nutt.** Barrenground willow, Short-fruited willow. Shrubs (0.25) 0.6–1.5 m tall, rarely taller; twigs below the leaves with epidermis breaking in translucent flakes, twigs of the season dark or reddish under the dense pubescence; stipules inconspicuous, deciduous; petioles 1–4 mm long, usually not longer than the bud, often reddish, the reddish color sometimes extending up the midrib of the blade; leaf blades (0.6) 1.5–4 cm long, (3) 5–18 mm wide, or to 7 cm long and 3 cm wide on sterile branches, 2–4 (5) times longer than wide, elliptical, broadly lanceolate, occasionally nearly linear, entire, thinly to moderately sericeous to nearly glabrous on both sides, strongly glaucous beneath; aments coetaneous or serotinous, nearly sessile or more often on bracteate peduncles at the ends of leafy twigs; bracts of the aments pale green, tan, or light brown in age, rarely pink or pale reddish at apex, scattered to densely pilose on both sides, the hairs exceeding the bract by about 1 mm or less; staminate aments (6) 8–10 (12) mm long, 5–6 mm wide; stamens 2, the filaments 2.5–5 mm long, densely pilose at base and scattered pilose to 1/3 to 3/4 the entire length, the pubescent portion sometimes exceeding the scale, anthers 0.3–0.5 (0.6) mm long, orbicular, yellowish; pistillate aments 8–25 mm long, 3–10 mm wide; capsules 3–5 mm long, densely arranged and mostly concealing the rachis, sessile or on stipes up to 0.5 (1) mm long, sometimes persisting over winter, pubescent, the hairs persistent even on over-wintering capsules, the style 0.5–1 mm long, the stigmas about 0.5 mm long, bilobed to the base. Along streams, in wet meadows, dry rocky and talus slopes, and rocky, open ground in mountains from 2070–3230 m, mostly on ground with basic substrate in Cache, Duchesne, Emery, Grand, Iron, Juab, Kane, Salt Lake, Sanpete, Sevier, Summit, Utah, and Wasatch counties; widespread in Alaska, Canada, and south in western United States from Oregon south and east to Colorado. Our plants are assignable to **var. *brachycarpa with bracts greenish at anthesis and subspherical or short cylindrical, densely flowered pistillate aments, leaves coarsely pubescent on both sides and with comparatively tall stature. Closely related to and often confused with *S. glauca*, but distinct in the state by small but numerous features. In addition to the features given in the key, *S. brachycarpa* more or less differs from *S. glauca* in having twigs with more numerous aments, distal leaves of fertile twigs often considerably larger than the 3 or 4 proximal ones, and reddish as well as yellowish petioles with the reddish color sometimes extending up the midrib of the leaf blade. Although most of our plants seem quite distinct, apparently there is widespread introgression with *S. glauca* in the Rocky Mountain Region and particularly southward in Colorado (Argus 1965); see discussion under *S. glauca*; 74 (xviii).

***Salix cascadensis* Cockerell.** Cascades willow. Depressed, mat-forming subshrubs, 1–3 cm tall, from tap root and rhizomatously much-branched caudex; petiole lacking or to 3 mm long; leaf blades 6–18 mm long, 1.5–4 mm wide, 2–4.7 times longer than wide, linear or narrow elliptical, entire, pilose-sericeous when young, soon glabrous

and green on both sides or slightly paler below, some marcescent for 1 or more years; aments coetaneous, terminal on short leafy lateral branches, these about 8–22 mm long; bracts of the aments persistent, black or purplish black, reddish-purplish at the very base, about 1–2 mm long, 1 mm wide, pilose on both sides, but less so to nearly glabrous at the base ventrally, the hairs about 1 mm long; staminate aments 3–12 mm long, 5–8 mm wide; stamens 2, separate to the base, the filaments about 3–4 mm long, glabrous, the anthers reddish or purplish; pistillate aments 5–22 mm long, 5–11 mm wide; capsules 3–4 mm long, pubescent, sessile or the stipe less than 1 mm long, the style and stigmas together about 1.5 mm long. Alpine tundra on the Uinta Mountains, 3350–3932 m, in Daggett, Duchesne, Summit, and Uintah counties; southwestern British Columbia, east to Montana south through Wyoming to Colorado and Utah; 15 (iv).

Salix drummondiana **Barratt in Hook.** Drummond willow. [S. *subcoerulea* Piper]. Shrubs (1) 2–3(4) m tall; twigs glabrous or puberulent when very young, heavily glaucous, the bloom persisting into the second year, yellow-brown to blackish purple beneath the bloom; stipules narrow, small and deciduous, or larger and more persistent on vigorous young shoots; petioles 4–12 mm long; leaf blades 2.2–8 cm long, (5) 13–20 mm wide, or to 14 cm long and 3 cm wide on vigorous young shoots, lanceolate or narrowly elliptical, rarely oblanceolate, entire, sometimes with slightly revolute margins, dark green and glabrous or thinly pubescent above, densely silvery white pubescence beneath with short appressed or spreading and slighty tangled hairs, pale glaucous beneath the pubescence; aments precocious or sub-coetaneous; bracts of the aments persistent, purplish black or purplish brown, pilose on both sides, the longest hairs exceeding the bract by 1.5–2 mm; staminate aments 19–22 mm long, 3–10 mm wide, sessile or on a peduncle to 3 mm long; stamens 2, the filaments, 4–9 mm long, glabrous; pistillate aments 2–4.5 cm long, 3–12 mm wide; capsules 3–6 mm long, pubescent, sessile or the stipe to 1 mm long, the style 0.5–0.7 mm long, the stigmas 0.3–0.6 mm long. Along streams and rivers, wet meadows, and other wet places from 2135–3140 (3290) m in Beaver, Box Elder, Cache, Daggett, Davis, Duchesne, Emery, Grand, Piute, Salt Lake, Sanpete, Sevier, Summit, Uintah, Utah, and Wasatch counties; British Columbia and Alberta south to California and New Mexico; 84 (xxv).

Salix exigua **Nutt.** Coyote willow, Dusky willow, Narrow-leaf willow. Colonial shrub (1) 2–3 m tall or rarely treelike and to 8 m tall; stems ashy gray, branches often reddish, twigs of the season greenish, pubescent; leaves (1) 2–11 cm long, (0.1) 0.2–1 cm wide, sessile or with 1–3 mm long petiole, or to 17.5 cm long and 1.6 cm wide with petiole up to 12 mm long on vigorous young shoots, linear, entire or serrulate-dentate with glandular teeth, glabrate to densely white sericeous; aments coetaneous or serotinous on slender leafy peduncles or twigs of the season, these 0.5–14 cm long; bracts of the aments about 2 mm long, about 1 mm wide, pale green or yellowish, deciduous, pubescent on both sides but often glabrate or glabrous dorsally especially toward the apex, occasionally only ciliate ventrally; staminate aments 1.5–4.5 cm long, 0.5–1 cm wide; stamens 2, the filaments pilose on the lower half; pistillate aments 1.5–6 cm long, 8–16 mm wide; capsules 4–7 mm long, mostly glabrous, sometimes pubescent, sessile or the stipe up to 0.8 mm long, the style obsolete. Along rivers and streams, irrigation ditches, washes, in neglected fields and pastures, around ponds and reservoirs, tolerant of alkaline soils, from 825–2315 (2590) m in all counties of the state. Our plants are part of a complex that extends from the Atlantic to the Pacific in the northern United States and southern Canada and extends from Alaska to northern Mexico in the western part of North America. Most of our specimens of ssp. *exigua* have glabrous capsules and can be assigned to var. *stenophylla* (Rydb.) Schneid. Some specimens from the northern part of the state have somewhat pubescent capsules and these may be var. *exigua*. The closely related S. *melanopsis* Nutt. has been reported for the area, but I have not seen any specimen that clearly belongs to that taxon. 170 (ii).

Salix fragilis **L.** Crack willow. Large trees to 20 m tall, the trunks to 1.3 m in diameter, solitary or few, erect or strongly leaning,

with thick furrowed gray or blackish gray bark; branches ascending, often large; twigs spreading, not pendulous, very brittle and easily broken at the base; leaf blades lanceolate to narrow elliptic, (2.5)3–17 cm long, (7)10–32 mm wide, acute or accuminate, serrate, glaucous or glaucescent beneath, glabrous or sericeous when young, glabrous when mature; aments coetaneous, on twigs of the current season, these twigs about 1–2.5 cm long, with (1)2–3(4) reduced leaves, the leaves like the larger leaves of the nonfloriferous twigs but sometimes oblanceolate; bracts of the aments pale green, pale yellow-green, or greenish white, tan or very pale brown upon drying, the pistillate ones deciduous by the time the capsules mature, sericeous with the hairs exceeding the bract by about 1–1.5 mm; staminate aments 3.5–7(9) cm long, 9–12 mm wide; stamens 2; filaments about 3–6 mm long, yellow, pilose toward the base, the pilose portion about equal or shorter than the subtending bract; pistillate aments (2.5)4–7 cm long, 10–13 mm wide; capsules 4–6 mm long, crowded but usually not so dense as to conceal the rachis, glabrous, the stipes about 1 mm long, the styles 0.5–1 mm long, the stigmas 0.2–0.3 mm long. Introduced from Eurasia, cultivated at homes and along streets, persisting, escaping, and naturalized along irrigation and natural waterways and lake margins, solitary to forming groves, from 1370–2075 m, in Beaver, Box Elder, Cache, Duchesne, Juab, Rich, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and probably most other counties of the state. Hybrids of S. *fragilis* x S. *alba* (S. x *rubens* Schrank.) have been developed (Rehder 1951). If such hybrids have been cultivated in the state, they could add considerable complication to the taxonomic separation of the two species; 30 (xiv).

Salix geyeriana **Anderss.** Geyer willow. Shrubs 1.5–4.5 m tall, twigs glabrous or scattered puberulent, strongly glaucous, the bloom sometimes deciduous; stipules minute and deciduous; petioles 3–10 mm long; leaves (1) 2–4.5 cm long (4) 8–12 mm wide, elliptical, narrow elliptical to narrow lanceolate, entire or nearly so, glaucus beneath, sericeous when unfolding, sparsely to moderately sericeous at maturity, especially below, the hairs white or a few pale reddish; aments subprecocious to coetaneous; peduncles of aments leafy or bracteate, the staminate 2–5 mm long, the pistillate 3–10 mm long; bracts of the aments persistent, sericeous-pilose on both sides, or glabrate or glabrous ventrally especially in age, the hairs exceeding the bract by 0.5–1 mm, the staminate ones light brown when very young, turning reddish to purplish black at the tips, those at the tips of aments turning first, the pistillate ones greenish brown to brown; staminate aments 7–15 mm long, 5–9 mm wide; stamens 2, the filaments about 4 mm long, pilose to about midlength, the pilose portion about equaling or exceeding the bract; pistillate aments 1–2 cm long, 6–15 mm wide; capsules 4–7 mm long, pubescent, the stipe (1) 2–3 mm long, the style 0.2–0.3 mm long; stigmas about 0.2 mm long. Along streams and rivers and in other wet places from 2195–2895 m, most common in the Uinta Mountains to Strawberry Valley, occasional elsewhere in the state, in Beaver, Cache, Daggett, Duchesne, Emery, Kane, Rich, Salt Lake, Sevier, Summit, Uintah, Utah, Wasatch, Washington, and Wayne counties; southern British Columbia south to California and east to Montana and Colorado. With glaucous twigs and whitish pubescence, our plants are assignable to **var. *geyeriana***; 67 (xix).

Salix glauca **L.** Glaucous willow, Grayleaf willow. [S. *pseudolapponum* Seem. in Engler]. Plants mostly low shrubs (0.1) 0.3–1 (3) m tall; twigs sometimes glaucous but mostly not, those below the leaves with epidermis exfoliating in translucent flakes, those of the season reddish under whitish pubescence, occasionally glabrate, often with a tuft of pilose hairs at the node; stipules mostly small and soon deciduous; petioles (1) 2–6 (18) mm long, mostly yellowish or greenish, the color often extending up the midrib of the blade; leaf blades 2–55 mm long, 7–22 mm wide, or to 9 cm long and to 5 cm wide on ends of vegetative twigs, elliptical, pubescent when young to glabrate or glabrous in age, mostly entire or rarely serrate; aments coetaneous, nearly sessile on old twigs or more often on bracteate peduncles or leafy, current twigs; bracts of the aments persistent, pale brown to blackish, pilose; staminate aments 1.5–4 cm long; stamens 2, the filaments free or united in unusual specimens, glabrous or sparsely pilose at the base, the

anthers 0.5–0.8 mm long; pistillate aments 1.5–5 cm long, 11–15 mm wide; capsules (4) 5–7 (9) mm long, densely pubescent to glabrate or glabrous in age, crowded but usually not so dense as to conceal the rachis, the stipes 0.5–2 mm long, the style 0.6–1 mm long, the stigmas about 0.5 mm long. Along streams, around springs, on talus slopes, snowflush areas, and dry alpine tundra but then usually in or near krummholz, from 2775–3660 m, on the Bear River, Uinta, and Wasatch mountains and Wasatch Plateau in Cache, Daggett, Duchesne, Salt Lake, Sanpete, Summit, Uintah and Wasatch counties; circumboreal, south in western North America in the Rocky Mountains to New Mexico. Highly variable plants with geographic phases. The Uinta Mountain plants from high elevations are more or less comparable to plants that have passed under the name of S. *pseudolapponum*, and they generally represent a rather low-statured phase. On windswept alpine summits, these plants approach the stature of S. *arctica*, but the stems are still ascending to erect. These Uinta Mountain plants tend more toward glabrescence in the capsules and have darker scales than is typical of those in the Bear River Range. The twigs are quite persistently pubescent. Leaves are seldom over 5 cm long or over 2 cm wide. Plants from the Bear River and Wasatch ranges have densely and persistently pubescent capsules, pale brown to dark brown to occasionally pinkish tan or rarely whitish tan scales, the twigs are sometimes early glabrate and some of the leaves are frequently over 5 cm long and over 2 cm wide. Specimens from Horseshoe Flat area of the Wasatch Plateau have glabrous or pubescent capsules, mostly dark scales, and glabrate and unusual, distinctly serrate leaves. The variability in S. *glauca* nearly encompasses S. *brachycarpa*. However, I prefer to follow Argus (1965) and keep the two separate; 57 (xii).

***Salix laevigata* Bebb.** Red willow. Shrub or tree 2–15 m tall; twigs reddish brown or dull brown, ashy red or ashy gray during exfoliation, stipules inconspicuous or to 6 mm long on vigorous vegetative twigs; usually deciduous, petioles stout, 4–14 mm long; leaf blades (1) 1.8–4 (6) cm long, 5–20 cm wide, or to 19 cm long and 4 cm wide on vigorous young shoots, narrowly to broadly lanceolate, glandular-serrulate, somewhat revolute, usually thick and firm, dark green and glabrous above, glaucous, and glabrous or pubescent toward the base and along the midrib; aments subprecocious to coetaneous, on leafy or bracteate twigs of the season; bracts of aments 1–2 mm long, at least the pistillate ones deciduous, pale yellow, crinkly pilose on both sides or often glabrous dorsally, entire or erose to dentate at apex; staminate aments 3–6 cm long, about 1 cm wide; stamens 3–7, pilose on lower half; pistillate aments 4–8 (11) cm long, to 1.5 mm wide; capsules 4–5 (6) mm long, glabrous, the stipes 1.5–2.5 mm long, styles 0.1–0.2 mm long, equaling the bilobed stigmas. Along drainages from 701–1370 m, in Washington, San Juan, and probably Kane counties; Arizona, California, Nevada, Utah, and northern Baja California. Perhaps not distinct from S. *bonplandiana* H.B.K., and treated as synonymous with that taxon by Dorn (1977); 16 (0).

***Salix lasiandra* Benth.** Whiplash willow; Caudate willow. Shrub or small tree (2) 3–6 (12) m tall; twigs glabrous or finely hairy when young; stipules often well developed, broadly rounded, gland toothed, 2–10 mm long, eventually deciduous; petioles 3–15 (25) mm long, often bearing 2 or more wartlike glands on the upper side at or near the base of the blade; leaf blades (2.2) 5.5–11.5 cm long, (5) 12–21 mm wide, or to 26 cm long and 5.5 cm wide on vigorous young shoots, lanceolate, elliptical or narrow elliptical, gradually long accuminate, closely serrulate, glabrous except when very young; aments coetaneous, on 1–3.5 cm long leafy-bracteate twigs, the leaves or bracts of the ament-bearing twigs 3–5 in number to 6.5 cm long and 1.2 mm wide, deciduous after the fruit matures; bracts of the aments deciduous (at least the pistillate ones) by the time the capsules start to open, 3–4 mm long, glabrous or nearly on the upper half, pubescent toward the base usually more so ventrally than dorsally, entire or minutely toothed at the apex with a few rounded teeth, the staminate yellow, the pistillate pale greenish; staminate aments 1.8–4.5 cm long, 3–12 mm wide; stamens 3–8, usually 5, the filaments pilose; pistillate aments 2–7 cm long, 11–18 mm wide; capsules 4–8 mm long, glabrous, the stipe 1–2 mm long, the style 0.5–1 mm long, the

stigmas to 0.5 mm long. Along streams and rivers, on flood plains, occasionally along irrigation canals, or around ponds, and reservoirs, from 1525–2440 (2621)m in Beaver, Box Elder, Cache, Carbon, Daggett, Davis, Duchesne, Emery, Garfield, Juab, Piute, Rich, Salt Lake, Sanpete, Sevier, Summit, Uintah, Utah, and Wasatch counties; to be expected elsewhere; Alaska and Yukon to California and New Mexico. Our plants are var. *caudata* (Nutt.) Sudw. with leaves about equally colored on both sides. Var. *lasiandra* with leaves glaucous beneath has been reported for the state, but I have seen no specimen; 98 (xxi).

Salix lasiolepis **Benth.** Arroyo willow. Shrubs or small trees mostly 4–6 m tall in our range; twigs yellowish olive to reddish, usually soft puberulent when young; stipules minute, soon deciduous or lacking, occasionally well developed on vigorous young shoots; petioles 3–15 mm long; leaf blades 1.5–4.2 cm long, 6–13 mm wide, or to 11 cm long and 2.5 cm wide on vigorous young shoots, usually oblanceolate or oblong, occasionally elliptical, entire, rarely minutely toothed, somewhat revolute margined, dark green and glabrous above, at maturity glaucous beneath, more or less coriaceous, rather densely soft pubescent on both sides when unfolding, less so above than beneath, few to many of the hairs persisting beneath at maturity; aments precocious to subcoetaneous on 3–6 mm long bracteate or bare peduncles; bracts of the aments persistent purple-black, obovate with broad rounded apex, densely villous, almost hidden in the hairs; staminate aments 2.2–4.5 cm long; stamens 2, the filaments glabrous; pistillate aments (1.8) 2.2–4.5 cm long (to 7 cm long outside of our area), 10–12 mm wide; capsules 3–4 (5) mm long, glabrous, the stipe 1–2 cm long, the style about 0.5 mm long, the stigmas 0.2–0.3 mm long. Along streams, ditches, and washes from about 1463–2328 m, in western Utah, Great Basin and Virgin River drainages, in Beaver, Iron, Juab, Millard, Sevier, Tooele, Utah, and Washington counties; southern British Columbia south to Baja California and east to Idaho, Utah, Texas and northern Mexico; 32 (xvii).

Salix lutea **Nutt.** Yellow willow. [S. *l.* var. *platyphylla* Ball; S. *l.* var. *watsonii* (Bebb) Jeps.]. Shrubs or rarely small trees but then still generally several stemmed at the base; (2) 3–5 (9) m tall; young twigs slender, yellowish to reddish at first, often pale on one side and red-purple on the other, glabrous; older twigs and smaller branches often grayish white; stipules small and inconspicuous or to 1 cm long or more and leaflike in texture on vigorous young shoots, usually deciduous; petioles 1–11 (20) mm long; leaf blades (1) 2–5.5 cm long, (4) 9–21 mm wide or to 10.7 cm long and 3 cm wide on vigorous young shoots, elliptical or lanceolate, rarely linear, entire or occasionally serrulate, glaucous beneath but hardly so when very young, usually glabrous at maturity, the lower surface glabrous from the first or less pubescent than above, the upper surface sometimes pubescent toward the base while the leaves are unfolding; aments precocious or subprecocious, on 1–7 mm long barren or 1–3 bracteate stalks; rachis and usually the stalk of the aments covered with a tangle of crisped-villous white hairs; bracts of the aments persistent, pubescent with crisped-villous, soon-entangled hairs, sometimes only moderately pilose-woolly toward the base or near the apex ventrally, the dorsal side usually glabrous toward the apex and often throughout as the crinkly hairs are readily deciduous; staminate aments 2–5 cm long, about 1 cm wide; stamens 2, the filaments glabrous, the anthers yellowish or turning purple; pistillate aments 2–7 cm long, to 2 cm wide; capsules 3–6 mm long, glabrous, mostly densely arranged on the rachis, occasionally a little scattered, the stipe (1) 1.3–3 (4) mm long, the style 0.2–0.7 mm long, the stigmas often scarcely bilobed. Along streams and ditches in valleys and canyons and occasionally on mountains from 1340–2255 (2350) m, in all counties of the state except Beaver, Carbon, Davis, Iron, Morgan, and Rich, and to be expected in some or all of these; New Mexico to California and north to Alberta. Our plants are closely related to and possibly a part of the S. *eriocephala* Michx. complex. They have been referred to as S. *rigida* Muhl., but Argus (1980) has placed S. *rigida* in synonomy under S. *eriocephala*. He did not place S. *lutea* in synonomy, but suggested that more study is needed. Until such a study is made, I believe it best to retain the traditional name of S. *lutea* for our

plants. *Salix ligulifolia* Ball has been reported for southern Utah. This has been separated from S. *lutea* by pedicels of capsules 1–2 mm long versus (1)2–4.5 mm long in S. *lutea*, and by having mostly entire rather than mostly serrulate leaves. At the varietal level such plants are referrable to S. *lutea* var. *ligulifolia* Ball. See discussion under S. *boothii*; 144 (xxv).

Salix monticola **Bebb ex Coult.** Shrubs 1.5–4 m tall; twigs yellowish when fresh, drying blackish, puberulent at first; stipules small and inconspicuous or leaflike on vigorous young shoots; petioles 5–10 (15) mm long; leaf blades 2–5 cm long, 0.7–1.5 mm wide or up to 11 cm long and 4 cm wide on vigorous young shoots, mostly elliptical or elliptic-obovate, crenate-serrate or subentire, slighty pubescent when very young, more so above than beneath, usually glabrous when fully expanded, glaucous beneath when mature; aments precocious or coetaneous, subsessile or on short stalks to 1 cm long, often subtended by bractlike leaves; bracts of the aments persistent, dark brown to blackish, pilose, or soon crisped-villous, the hairs exceeding the bract by about 2 mm, more or less tangled; staminate aments 2–3.5 cm long, about 1–1.5 cm wide; filaments 2, glabrous; pistillate aments 2–6 cm long, 1–1.5 cm wide; capsules 4–7 mm long, glabrous, subsessile, the stipe less than 1 mm long; style 0.7–1.8 mm long, longer than the stigmas. Along streams and other wet places from 2195–3200 m, on mountains of eastern and central Utah in Beaver, Garfield, Piute, San Juan, Sanpete, Sevier, Uintah, and Wasatch counties, and to be expected elsewhere in eastern Utah, but apparently uncommon in the state; Rocky Mountains of southern Wyoming, Colorado, Utah, Arizona, and New Mexico. Closely allied to S. *boothii* and S. *lutea* and rather easily confused with them. Separation from S. *boothii* is often compounded by the lack of glaucescence on young leaves; I am indebted to Dr. Robert Dorn for his annotations of specimens of this taxon. More specimens are needed to gain a better understanding of this plant in the state; 12 (0).

Salix nigra **Marsh.** Black willow. [S. *gooddingii* Ball]. Trees or occasionally shrubs (2) 6–10 (24) m tall; twigs of the season yellowish, glabrous, or finely pubescent at first; stipules to 8 mm long, more or less glandular, usually quickly deciduous; petioles 3–7 mm long; leaf blades 2–7.5 cm long, 6–16 mm wide or to 10.2 cm long and 18 mm wide with petiole to 15 mm long on vigorous vegetative twigs, narrowly to broadly lanceolate, apex short to long acuminate, entire or more often glandular-serrulate, greenish on both sides, pubescent when unfolding but becoming glabrous or glabrate; aments coetaneous, on lateral 1–6 cm long twigs of the season with 3–6 leaves or bracts; bracts of aments pale green or pale yellow, soon fading to tan, and at least the pistillate ones deciduous, pubescent on both sides or glabrous toward the apex, entire or with 1–3 minute, rounded teeth; staminate aments 2.5–6.5 cm long, 5–10 mm wide; stamens 3–6, the filaments pilose to about midlength; pistillate aments 1.5–6 cm long, 10–17 mm wide; capsules 4–7 mm long, glabrous, not so densely arranged as to conceal the rachis, the stipe 1–2 mm long, the style 0.1–0.3 mm long. Along the Virgin and San Juan rivers and other drainages in southern Utah, and up the Green River to near Moab from 825–1585 m, in Garfield, Grand, Kane, San Juan, and Washington counties; widespread in the continental United States, southern New Brunswick, and southern Quebec and Ontario, and northeastern Mexico. Utah specimens quite consistently have light-colored twigs and have been called S. *gooddingii*. I feel as did Archer (1965) that S. *gooddingii* is not clearly distinct from S. *nigra*. Arthur Cronquist (unpubl. ms.) has placed S. *gooddingii* in synonomy under S. *nigra* var. *venulosa* (Anderss.) Bebb, and he recognized our plants as being different in having smaller stature and usually having some pubescence on the capsules or stipes, or both, as well as having light-colored twigs. However, he further states that these features are not consistent. I prefer to follow Cronquist's approach and recognize the differences in our plants at the varietal rather than at the specific level. *Salix nigra* and S. *amygaloides* come together near Moab on the Green River, and notes on specimens from that area by Arthur Cronquist indicate that the two hybridize at that location; 23 (0).

Salix planifolia **Pursh.** Plainleaf willow. [*S. phylicifolia* L. ssp. *planifolia* (Pursh) Hiitonen]. Shrubs 0.5–1.5 (4) m tall; twigs below the leaves often with epidermis exfoliating in translucent flakes or strips, younger twigs typically glabrous and lustrous black or purplish black, rarely glaucous in part; stipules small and usually deciduous; petioles 2–10 mm long; leaf blades 1.2–3.8 (8) cm long, 4–13 (30) mm wide, or to 5 (13) cm long and 2 (5) cm wide on vigorous sterile twigs, elliptical or narrow elliptical, soon glabrous and dark green above, glaucous and glabrous to sparingly pubescent below, entire or rarely with minute teeth; aments precocious (at least the staminate) to coetaneous, nearly sessile or rarely on a short, mostly barren peduncle to 0.5–1 cm long; bracts of the aments persistent, blackish, scattered to densely villose to pilose, the hairs usually exceeding the bract by about 2 mm; staminate aments 10–25 mm long; stamens 2, the filaments glabrous, about 6 mm long; pistillate aments 2–4 cm long, 1–1.5 cm wide; capsules 3–7 mm long, typically pubescent at least near the base, occasionally glabrous or nearly so in age, the stipe mostly less than 1 mm long, the style and stigmas together mostly over 1.5 mm long. Streamside meadows, around lakes and ponds and other wet places, most abundant and sometimes forming willow fields in the Uinta Mountains, scattered on high points of the plateaus and mountains of the central and southern part of the state, from (2255) 2895–3660 m in Daggett, Duchesne, Garfield, Iron, Salt Lake, Sanpete, Sevier, Summit, and Uintah counties; circumboreal, south to California and New England. I have followed Argus (1973) in listing our plants under *S. planifolia* rather than *S. phylicifolia*. Our plants mostly fall well within the concept of var. *monica* (Bebb) Jeps., though a few taller plants with larger leaves from moderate elevations of the major drainages in the Uinta Mountains are apparently var. *planifolia*. However, the differences are merely of stature and of leaf size and the two varieties are hardly worthy of separation; 39 (ix).

Salix reticulata **L.** [*S. nivalis* Hook.; *S. n.* var. *saximontana* (Rydb.) Schneid.]. Caespitose dwarf shrubs, stems creeping at or just below the ground surface, the slender aerial twigs rarely more than 2–3 cm long, usually prostrate; stipules minute and deciduous or none; petioles 1–8 (15) mm long; leaf blades 0.5–3 cm long, 0.3–2 cm wide, ovate, obovate, orbicular or occasionally broadly elliptical, entire, glabrous, green above, glaucous beneath, strongly reticulate veined; aments subcoetaneous, but mostly serotinous on the ends of shoots of the season; bracts of the aments persistent, pale green or yellowish, sometimes with reddish tops, spatulate or obovate, glabrous or sparsely pubescent ventrally, especially toward the margin, with short hairs that extend less than 1 mm beyond the bract; staminate aments 0.5–2 cm long, slender, the flowers loose and not concealing the puberulent rachis, on a slender glabrous peduncle about 10–12 mm long; stamens 2; filaments 1.5–2 mm long, glabrous or pilose toward the base; anthers soon reddish or purple; pistillate aments 5–15 mm long, 5–8 mm wide, on a slender 1–2 mm long peduncle; capsules 1.5–3 mm long, pubescent or glabrous in age, sessile or the stipe to 0.5 mm long, the style obsolete or to 0.2 mm long, the stigmas about 0.1–0.2 mm long. Open rocky slopes and ridges and alpine tundra from 2987–3965 m, on the LaSal, Uinta, and Wasatch Mountains in Duchesne, Grand, Salt Lake, San Juan, Summit, and Utah counties; circumboreal, south in the mountains of western North America to California, New Mexico, Utah, and Colorado. Most of our plants are referable to **var.** ***saximontana*** **(L.) Kelso**, which may not be distinct from var. *reticulata*. A few specimens seem to be like var. *nivalis* (Hook.) Anderss. The features used for separation seem to be poorly correlated in our plants. Some plants with pistillate aments less than 1 cm long (that should be var. *nivalis*) have leaves well over 15 mm long, which is indicative of the other variety; 32 (0).

Salix scouleriana **Barratt in Hook.** Scouler willow. Shrubs or small trees 3–7 m tall; stipules small and inconspicuous or large and leaflike on vigorous young shoots, eventually deciduous; petioles 2–11 mm long; leaf blades 2–6 cm long, (0.8) 1–3 cm wide or to 11.5 cm long and 4 cm wide on vigorous young shoots, obovate to oblanceolate, rounded to acute or occasionally accuminate at the apex, entire or finely serrate, or occa-

sionally coarsely crenate or serrate on larger leaves of vegetative twigs, densely crisp-hairy or sericeous, especially beneath as they unfold, the mature ones dark green and glabrous above except sometimes puberulent along the midrib, the lower side strongly glaucous, sparsely puberulent with translucent whitish or rusty minute hairs, or occasionally densely felty-villous; bracts of aments blackish or purplish black nearly throughout, reddish or pale at the very base, sericeous-pilose on both sides, the hairs at the apex usually exceeding the bract by 1.5–2 mm; staminate aments 15–35 mm long, nearly as wide as long, strictly precocious, nearly sessile or on thickened bracteate peduncles to 7 mm long, the bracts 3–4 mm long, about 2 mm wide, pale green to whitish, sericeous; stamens 2, the filaments to 11 mm long at maturity, glabrous; pistillate aments 2–6 cm long, 13–17 mm wide, precocious or subcoetaneous, nearly sessile or on thickened bracteate peduncles to 17 mm long, the bracts to 7 mm long and 2 mm wide, not at all leaflike; capsules (5) 6–9 mm long, pubescent, rarely nearly sessile, usually on a 1–3 mm long stipe, the style 0.3–0.4 mm long, rarely shorter, the stigmas 0.5–1 mm long. Around springs, along streams, and on well-drained slopes in aspen and conifer woods, from (1400) 2377–2835 (3355) m, in Box Elder, Cache, Carbon, Daggett, Davis, Duchesne, Garfield, Grand, Juab, Millard, Rich, Salt Lake, Sanpete, San Juan, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Washington, and Weber counties; Alaska and Yukon to California, Arizona, and New Mexico. *Salix scouleriana* is most closely allied to *S. humilus* Marshall and to *S. discolor* Muhl. of eastern United States and Canada. *Salix discolor* (pussy willow) may be cultivated in our area. It is generally distinguished from *S. scouleriana* by: looser aments with longer stipes (1.5–3 mm), more elliptic, pointed, and toothed leaves that are usually more quickly and fully glabrate, but none of these features is wholly consistent (Hitchcock and Cronquist, 1964). Occasionally specimens have leaves densely pubescent beneath. Arnow et al. (1980) attributed this to hybridization with *S. drummondiana*; 69 (xi).

Salix wolfii* Bebb in Rothr.** Wolf's willow. Shrubs 0.6–1.5 (2) m tall; twigs yellow to orange when young, chestnut brown in age, those of the season thinly villous-puberulent; stipules 1–5 mm long, often glandular-serrulate, eventually deciduous; petioles 2–10 mm long; leaf blades 1.2–4.2 cm long, 5–13 mm wide or to 5.3 cm long and 16 mm wide toward the ends of vigorous vegetative twigs, narrow elliptical, linear-lanceolate, or occasionally oblanceolate, entire, sparsely to densely sericeous-tomentose on both sides even in age or glabrate beneath very late in the season; aments coetaneous or subserotinous, nearly sessile or on bracteate peduncles to 1 cm long; bracts of the aments persistent, blackish or pale at the very base, pilose-sericeous on both sides, the hairs exceeding the bract by about 1 mm; staminate catkins 10–15 mm long, about 8–10 mm wide; stamens 2, the filaments about 3–4 mm long, glabrous; pistillate aments 8–20 (30) mm long, 6–10 mm wide; capsules 3–5 mm long, glabrous or rarely pubescent, the stipe less than 1 mm long, the style about 0.5 mm long, the stigmas about 0.2 mm long. Along streams and around the margins of lakes and ponds, occasionally forming willow fields, in the Bear River and Uinta mountains and West Tavaputs and Wasatch plateaus from 2470–3290 m, in Cache, Daggett, Duchesne, Emery, Summit, Uintah, and Wasatch counties. Oregon to Montana, south to Nevada, Utah, and Colorado. Our plants are **var. *wolfii with mostly glabrous capsules. One specimen (B. Maguire, D. Hobson, & R. Maguire 14104) from White Pine Lake, Cache County, has pubescent capsules and leaves that are larger than others from the state. This specimen is like *S. wolfii* var. *idahoensis* Ball, which is known from well north and west of Utah. Other specimens from the vicinity of White Pine Lake and other points in the Bear River Range have glabrous capsules, and I prefer not to list var. *idahoensis* for the state based on this one specimen. The plants from the Bear River Range with pistillate aments 15–30 mm long do, however, seem intermediate toward var. *idahoensis* when compared to those of the Uinta Mountains with pistillate aments 8–15 mm long. The specimen with pubescent capsules and somewhat large leaves is probably the basis of reports of *S. commutata* Bebb for Utah; 44 (ix).